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EFFECT OF VARIABLES INDEPENDENT OF PERFORMANCE ON PROMOTION RATES TO MAJOR, LIEUTENANT COLONEL, AND COLONEL IN THE MARINE CORPS

by

Peter F. Long

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Thesis Advisor: Robert R. Read

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The models developed in this analysis provide a tool for Marine officers who need a quick, reliable promotion predictor to assist in career assignments or choices. These models use several easily obtained factors to forecast selection rates for promotion to Major, Lt.Colonel and Colonel. Specifically, factors which can be used to predict selection rates to all the aforementioned paygrades are MARITAL STATUS, ATTENDANCE AT AN APPROPRIATE LEVEL PROFESSIONAL SCHOOL, and ATTAINMENT OF A POSTGRADUATE DEGREE. Duty assignment, commissioning source, and personal awards are significant factors, also, but not universally. Significant by their lack of influence on selection rates are RACE, SEX, and COMBAT EXPERIENCE. Other factors also studied but not mentioned in the abstract are discussed in the body of this analysis.

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22a. NAME OF RESPONSIBLE INDIVIDUAL
Robert R. Read

22b. TELEPHONE (Include Area Code)
(408)646-2382

22c. OFFICE SYMBOL
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Effect of Variables Independent of Performance on Promotion Rates to Major, Lieutenant Colonel, and Colonel in the Marine Corps

by

Peter F. Long
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Author: _____
Peter F. Long

Approved By: _____
Robert R. Read, Thesis Advisor

_____
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_____
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ABSTRACT

The models developed in this analysis provide a tool for Marine officers who need a quick, reliable promotion predictor to assist in career assignments or choices. These models use several easily obtained factors to forecast selection rates for promotion to Major, Lt.Colonel and Colonel. Specifically, factors which can be used to predict selection rates to all the aforementioned paygrades are MARITAL STATUS, ATTENDANCE AT AN APPROPRIATE LEVEL PROFESSIONAL SCHOOL, and ATTAINMENT OF A POSTGRADUATE DEGREE. Duty assignment, commissioning source, and personal awards are significant factors, also, but not universally. Significant by their lack of influence on selection rates are RACE, SEX, and COMBAT EXPERIENCE. Other factors also studied but not mentioned in the abstract are discussed in the body of this analysis.

TABLE OF CONTENTS

I. INTRODUCTION 1

II. BACKGROUND 3

A. DEFINITIONS 3

B. PROMOTION BOARD DESCRIPTION 4

C. MASTER PERSONNEL FILE 5

D. THE BRIEF AND EXECUTIVE SESSION 5

III. DATA 6

IV. VARIABLE SELECTION 11

V. MODEL DEVELOPMENT 20

VI. MODEL ANALYSIS 22

VII. CONCLUSIONS 28

APPENDIX A MODEL APPLICATION 31

APPENDIX B COEFFICIENTS FOR SELECTION TO MAJOR 33

APPENDIX C COEFFICIENTS FOR SELECTION TO LT. COL 34

APPENDIX D COEFFICIENTS FOR SELECTION TO COLONEL 35

APPENDIX E CROSS TABULATION TABLES FOR PROMOTION TO MAJOR 36

APPENDIX F CROSS TABULATION TABLES FOR PROMOTION TO LT. COL 44

APPENDIX G CROSS TABULATION TABLES FOR PROMOTION TO COLONEL 56

APPENDIX H SAS CODE TO TRANSFORM DATA FROM ASCII TO CSS AND S+ READABLE DATA 60

APPENDIX I SAMPLE OF TRANSFORMED DATA 66

LIST OF REFERENCES 68

INITIAL DISTRIBUTION LIST 69

I. INTRODUCTION

The purpose of this analysis is to provide a tool for use by officers assigned to the Officer Promotion Branch, HQMC, or any Marine officer who has a need to determine officer selection rates. Traditionally, an officer's service history is studied, complete with fitness report analysis, to provide insight into the competitiveness of a particular officer. The models developed in this study, however, use several significant factors in predicting officer selection rates without reconstructing an officer's fitness report history, and can provide timely forecasts of selection rates. The selection process is described in the first chapter of this thesis. It is a long process, involving numerous officers and a great deal of discussion by the members of the promotion board. Prior to convening the board, however, the officer in the promotion zone (see definition, p. 3) may want an indication of his chances for selection, as may the MOS Monitor/OccField Sponsor. These models can serve as timely aids to these decision makers prior to the board and prior to career decisions affecting the officer.

Variables having an impact on selection rates that remain consistent regardless of rank are MARITAL STATUS, ATTENDANCE AT AN APPROPRIATE LEVEL PROFESSIONAL SCHOOL, and ATTAINMENT OF A POST-GRADUATE DEGREE. Duty Assignment and Commissioning Source serves also as contributing factors to varying degrees, depending on the rank to which an officer is "in zone."

The most notable factors not having an effect on selection rates are RACE, SEX, and COMBAT EXPERIENCE. Other factors were studied and are included in the body of this analysis, but do not warrant mention at present.

II. BACKGROUND

The United States Marine Corps operates three promotion systems: a system for active duty officers based on the Defense Officer Personnel Management Act (DOPMA), a system for reserve officers not on active duty based on Title 10 U.S. Code Chapter 549, and a very large system for the enlisted force based on Navy Department regulations as well as Marine Corps orders and policies. Criterion differ slightly for each promotion category, but for active duty officers, the criterion for selection is simply "best qualified for service in the higher grade." [Ref. 1]

The number of officers who may be selected is determined by the annual promotion plan in which planners compare authorized strengths and projected losses to predict vacancies. This 'zone size' is further determined by DOPMA regulated 'promotion opportunity,' i.e., DOPMA requires a certain percentage of officers be selected for promotion. The board then selects officers in advance in order to fill authorized vacancies as they become available.

A. DEFINITIONS [Ref. 2]

Promotion Zone. A promotion eligibility category consisting of officers on the active - duty list in the same grade and competitive category who, in the case of officers below colonel, have neither failed of selection for promotion nor been removed from a list of officers who have been recommended for promotion to that grade and are senior to the junior officer in the promotion zone eligible for consideration for promotion to the next higher grade.

Above Zone. Officers who have been previously considered in the promotion zone and not selected.

Below Zone. Officers eligible for consideration but junior to the junior officer in the promotion zone.

Promotion Opportunity. A percentage based on the following equation for each grade and competitive category:

$$\text{Promotion Opportunity} = \frac{\text{\# of officers to be selected}}{\text{\# of officers in the promotion zone}}$$

Competitive Category. A category established to provide for separate promotion consideration and career development of groups of officers possessing related skills and experience necessary to meet the mission objectives of the Department of the Navy.

Grade. A step of degree, in a graduated scale of officer or military rank, that is established and designated as a grade by law or regulation. Also, a grade to which a permanent appointment has been tendered by competent authority and accepted by a member of the Armed Forces.

Promotion Flow Points. Required years of commissioned service to be eligible for promotion to the next higher paygrade. Promotion Flow Points are established by DOPMA.

Precepts. Formally written documents that reduce all laws and regulations to simple guidance. They also serve as vehicles for the Secretary of the Navy to communicate the special needs of the Marine Corps to the board. Among other things, the precept sets the number of officers that may be selected as well as the number that can be picked below zone, establishes selection criterion, and provides information on shortages within occupational fields.

B. PROMOTION BOARD DESCRIPTION

The membership of the promotion board is not revealed until the boards are convened. Boards are composed of officers at least one paygrade senior to the officers being considered, and represent all occupational fields and commands from all geographic regions. If women are considered for promotion, a woman officer should also sit on the board.

C. MASTER PERSONNEL FILE

The primary tool of the selection board is the master personnel file. The master personnel file is a microfilm record of every piece of correspondence produced or received by Headquarters Marine Corps on an individual Marine. There are three parts to this file: fitness reports, commendatory or derogatory material, and miscellaneous administrative material. The board normally concerns itself only with fitness reports and commendatory or derogatory material. The fitness reports are summarized for each officer on a Master Brief Sheet. All pertinent information from the officer's file is summarized in tabular fashion. A board member (briefer) verifies all information on the master brief sheet, and briefs the officer's case from those files.

D. THE BRIEF AND EXECUTIVE SESSION

The briefer is to provide the total picture of every Marine he is assigned. The briefer carefully reviews all fitness reports, noting significant comments of reporting seniors and reviewing officers in the remarks and observations column of the master brief sheet. Board members may question or request amplifying information on each officer being briefed. Such additional information would include awards and decorations, civilian and military education, and fitness report Section C narrative data to reinforce remarks on the officer's master brief sheet. The board then votes on each officer's selection. [Ref. 1] Officers are selected by majority vote.

III. DATA

To develop the data base, I selected all the officers in the primary zone for promotion in fiscal years 1986 through fiscal year 1992. Each board is presented with a precept, which might produce observations which are peculiar to that particular year. Using a period of 7 years, I hoped to do away with any singular differences between boards and show how the trend towards selection would be affected by the models I developed.

Data for this analysis had to be available and obtainable from existing USMC data bases, and it had to adequately describe the officer in the primary zone. Ideally, performance data would be used to determine selection rates, but gathering data of that source would be time prohibitive. It would involve gaining access to individual Master Brief Sheets, quantifying each Fitness Report Section B mark, and identifying certain key words and phrases as positive or negative, and assigning a value to the number and quality of the narrative in the Fitness Report. I ignored performance in this analysis and concentrated on variables that could be more readily made available. We will see, however, that performance is a basis for a number of the variables chosen for the models.

I determined that the following categories would be useful in describing the officer in the promotion zone:

Fiscal Year:	FY 86 - 92 were chosen. As the most recent boards, they would reflect current policy and would make the model valid for the near term.
Paygrade:	The paygrades the officer was being considered for promotion to were 04, 05, and 06, i.e., to major, to lt.col, and to colonel.
Selected:	Was the officer selected for promotion to the next higher paygrade?
SSN:	Used to identify each officer when obtaining records from the HQMC data base. Privacy act regulations do not allow release of these records with SSN included. SSN was not used in the analysis.
Marital Status:	Married, single, divorced, legally separated, widowed, annulled were the codes in the data base to describe the officer's marital status.
Race/Ethnic:	Caucasian, Black, Hispanic, Asian Pacific Islander, Native American, and Other were the categories used to describe the background of the officer. Less than 6% of the entire population was nonwhite, which necessitated combining the nonwhite groups into a separate category.
Sex:	Male or Female. Less than 4% of the population is female.
Primary MOS:	Military Occupational Specialty is the specialty the officer is assigned. There are over 60 PMOS designators in the MOS Manual, so these were grouped by category.
Billet MOS:	The billet to which the officer was assigned at the time of the board. Billet MOS may not match Primary MOS, depending on the duty station and assignment of the officer.
PMCC:	Primary Monitor Command Code is the code which describes the unit to which the officer is assigned. Each unit in the Marine Corps has its own PMCC.
Source of Entry:	The commissioning source of the officer. There are numerous different sources ranging from the service academies to direct commissioning programs.

Education Level:	Code which describes the level of education attained by the officer. Ranges from undergraduate degree to post doctoral work.
GCT Score:	General Classification Test Score which is on a 160 point scale. All marines take the test. A score of 100 is considered the Marine Corps average, with officers scoring above that.
Personal Awards:	The numerous personal awards (medals) awarded for professional achievement. Range from the Navy Achievement Medal to the Congressional Medal of Honor.
PME:	Professional Military Education. Appropriate level school for an officer based on rank and experience. Selection for school is competitive.
Combat:	Combat service codes for hostilities from Vietnam to the Persian Gulf are included.
DOR:	Date of rank. The date the officer was promoted to his present rank.
Year of Commission:	The year the officer was initially commissioned.

The data was provided (in ASCII format) by the Management Information (MI) Branch at HQMC. Of particular importance is the fact that the data presents a "snapshot" of the officer when the board convenes. The Duty Station is that one where an officer is assigned when the board convenes. Tracking the career path of each officer to determine questions concerning assignment to a specific billet is possible, but well beyond the scope of this analysis. A sample of the raw data is shown in Appendix [I]. The data itself is on the NPS mainframe under my file: "LONGALL DATA B1." The SAS routine I used to sort the raw data into a format that could be analyzed is shown in Appendix [H].

The size of the data exceeded one megabyte of storage space. To facilitate model building and speed up the analysis, I built models and performed analysis for each paygrade. As previously mentioned, individual year groups can be analyzed, but I chose to analyze the data over the entire span of the year groups to model trends.

Closer examination of the data shows numerous dimensions for each variable chosen, especially PMOS, MCC, and Personal Awards. Analysis of the data plus personal experience in the Marine Corps, led me to reduce the number of dimensions to a manageable number and assign new names to those dimensions. The variables (and dimensions) are summarized below:

VARIABLE	DIMENSIONS	REMARKS
SSN	1 PER OFFICER	NOT ANALYZED
FISCAL YEAR (FY)	1986 - 1992	INITIAL ANALYSIS ONLY
PAYGRADE (PG)	O3, O4, 05	ANALYZED SEPARATELY
MARITAL STATUS	MARRIED (M) SINGLE (S)	COMBINED ALL TO EITHER MARRIED OR SINGLE
RACE	WHITE NONWHITE	SMALL NONWHITE POPULATION ALL IN ONE CATEGORY CALLED NONWHITE
SEX	MALE (M) FEMALE (F)	SMALL FEMALE POPULATION, < 4%

VARIABLE	DIMENSIONS	REMARKS
OCCFIELD	COMBAT ARMS FIX WING PILOT RTRY WING PILOT NFO (GIB) SUPPORT	MAJOR GROUPING OF OCCUPATIONAL FIELDS (PMOS)
DUTY STATION	FLEET MARINE FORCE (FMF) NON FMF QUANTICO HQMC RECRUITING DUTY	MAJOR GROUPING OF DUTY ASSIGN-MENTS. ANALYSIS OF ALL MCCs LED TO THE CHOICES.
SOURCE OF COMMISSION	USNA ROTC OCS	THREE PRIMARY COMMISSIONING SOURCES. OCS INCLUDES ALL SOURCES NOT IN USNA OR ROTC.
DEGREE	ADVANCED UNDERGRADUATE	ADVANCED IS A MASTERS DEGREE OR HIGHER
MEDALS	2 OR MORE LESS THAN 2	ANALYSIS SHOWED THAT 2 OR MORE MEDALS WAS SIGNIFICANT
APPROPRIATE LEVEL SCHOOL (ALS)	YES NO	ATTENDANCE AT A FORMAL MILITARY SCHOOL AT THAT PAYGRADE
COMBAT	YES NO	INCLUSION OF A COMBAT SERVICE CODE. SERVICE FROM VIETNAM TO SAUDI INCLUDED

The transformed data was compiled using the SAS routine in Appendix [H]. A sample of the transformed data can be found in Appendix [I].

IV. VARIABLE SELECTION

I initially performed analyses on each variable to compare its selection rate against the overall selection rate for the population (based on paygrade) over the entire 7 year period. The selection rates for the respective paygrades are:

PROMOTED TO	SELECTION RATE
MAJOR	65.55%
LT. COL.	52.80%
COLONEL	40.86%

I compared selection rates, chi-square values for each variable, and p-values (I wrote SAS routines specifying the chi-square analysis). Inclusion or exclusion of specific variables for the models are discussed below:

SSN: I included the SSN for identification purposes only. The software package S+ requires nonrecurring first entries (when the default option of sequential line numbering is over ridden) to specify entries, so the SSNs were used in that regard. Privacy act regulations prohibit displaying of SSNs when married up with specific personal and/or professional data.

FISCAL YEAR: The data base contains the records of all Marine Corps Officers of paygrade O3 (Captain), O4 (Major), and O5 (LtCol) in the primary promotion to the next higher paygrade in fiscal years 1986 through 1992, inclusive. Board precepts change from year to year, so individual board statistics were not analyzed as part of this study. The entire population based on paygrade was used to discover trends in variables affecting selection.

Many variables were analyzed by fiscal year (initially) to determine if there was annual fluctuation within variables. Some variables evidenced annual variation from the overall selection rate. Some variables were even subdivided further to determine if any difference existed within the variable itself. The following shows the variation of the selection rate to Major for officers assigned to operational (FMF) units when the board convened. The FMF variable is further broken down to which Marine Expeditionary Force (MEF) the officer is in. The Marine Corps has 3 MEFs. I MEF is headquartered in Camp Pendleton, CA, II MEF is at Camp LeJeune, NC, and III MEF is headquartered in Okinowa, Japan. Promotion rates varied by MEF (over the entire period). The rates by FY for each MEF are shown below:

FY	I MEF	II MEF	III MEF
86	62.86%	72.73%	68.42%
87	43.75%	41.67%	61.54%
88	72.73%	87.50%	85.71%
89	50.00%	72.00%	60.00%
90	50.00%	69.57%	70.00%
91	33.33%	40.00%	85.71%
92	50.00%	75.00%	66.67%

Overall selection rate to Major (O4) for each MEF was

I MEF 53% II MEF 65% III MEF 70%.

The number of officers in a particular MEF in the primary promotion zone in a given fiscal year ranged from a low of 7 (III MEF FY 88) to a high of 44 (II MEF FY 80). With a small number of officers in such a category, analysis of the rates is interesting, but does not prove to be statistically significant, especially when using a variable such as FMF to group the officers against officers assigned elsewhere. Also, as seen, the selection rates over time show a trend against officers assigned to I MEF, but when the MEFs are

combined, the FMF selection rate is within 2% points of the overall selection rate (for promotion to major).

PAYGRADE: The current paygrade of the officer in the primary promotion zone used to study the effects of a variable on selection.

SELECTED: The truth teller. Was an officer selected for promotion to the next higher pay grade? This variable is the one the entire study is based on.

MARITAL STATUS: A long held personal belief that single officers are discriminated against in the Marine Corps led the author to include this variable (I'm single!). The "SINGLE" variable includes those officers who are widowed, divorced, legally separated, and annulled, along with being plain old single.

RACE/ETHNIC BACKGROUND: The ethnic background of officers in the population is overwhelmingly Caucasian (WHITE). Black officers make up the next largest segment (just under 4%) with Hispanic, Native Americans, Asians and "Other" making up about 2% of the population. For this reason, the categories were reduced to two: WHITE and NONWHITE.

SEX: Two options. Women officers make up less than 4% of the population. Most of the analysis by fiscal year was inconclusive, therefore the whole period was used to get numbers large enough to do analysis.

OCCUPATIONAL FIELD: The Marine Corps lists over 40 individual primary MOSs that officers hold. Individual MOSs were analyzed just as were duty stations, with the same results. Annual variations based on the needs of the Marine Corps caused some MOSs to be selected at an above average rate one year, and below average other years. I combined the PMOSs into 5 categories, based on major type of specialty:

CATEGORY	INCLUSIVE SPECIALTIES
COMBAT ARMS	INFANTRY, ARTILLERY, TANKS, TRACKED VEHICLES
FIXED WING PILOT	F-18, AV-8, A-6, C-130, C-9, A-4, F-4 ANY PILOT NOT FLYING HELICOPTERS
ROTARY WING PILOT	CH-46, CH-53, UH-1, AH-1 HELO PILOTS
NAVAL FLIGHT OFFICER (NFO/GIB)	NON PILOT COCKPIT CREW
SUPPORT	ANY OTHER MOS NOT SPECIFICALLY ASSIGNED ABOVE. ANY MARINE NOT DIRECTLY INVOLVED IN DIRECT COMBAT WITH THE ENEMY.

DUTY STATION: The Marine Corps Codes Manual lists a separate Monitored Command Code (MCC) for each major command. The number of MCCs is prohibitively large for analysis of selection rate by MCC. That plus the small number of officers assigned to a particular MCC at the time of the board makes meaningful analysis impossible. Analysis of several type commands plus personal experience led to the following categories of Duty Stations:

FLEET MARINE FORCE(FMF): The officers assigned to operational combat or combat support units. As previously discussed, the FMF is composed of three separate expeditionary forces. The hierarchal description of the separate MEFs is covered extensively in numerous doctrinal publications and will not be discussed in this study.

HEADQUARTERS MARINE CORPS (HQMC): Those officers stationed or assigned to HQMC, at the Navy Annex in Arlington, VA.

QUANTICO: Those officers assigned to any of the separate commands aboard Marine Corps Base, Quantico, VA.

RECRUITING DUTY: Those officers assigned to the numerous recruiting offices, stations or districts.

NON FMF: Officers assigned to commands not specifically covered by the above categories. Includes Marine Corps Security Forces, overseas headquarters, Marine Corps Base support positions, and the Recruit Depots at Parris Island, SC, and San Diego, CA.

EDUCATION LEVEL: There are six different codes assigned to officer education level, from an undergraduate degree through post doctoral education. For ease of analysis, the cutoff was made at the advanced degree level, which includes a masters degree and education beyond that level. The two categories, advanced and undergraduate, describe the level of all the officers in the data base.

SOURCE OF ENTRY: There are about 20 different codes describing the commissioning source of a Marine Officer. I simplified the analysis by grouping the sources into the three most identifiable categories: USNA, ROTC, OCS. The OCS category includes all officers who did not graduate from the US Naval Academy, or did not complete the ROTC in college.

GENERAL CLASSIFICATION TEST (GCT): Upon commissioning, every officer (and all enlisted upon induction in boot camp) is administered the GCT test to measure basic math, reading, and reasoning skills. Analysis of various test scores showed a significant difference in selection rates at the 125 GCT level. The two categories, therefore, are HIGH (GCT $\geq$ 125) and LOW (GCT < 125).

MEDALS: Personal awards are normally awarded in the Marine Corps for professional achievement (notwithstanding the classic "End of Tour Award") which merits special recognition. Analysis of the total number of medals awarded to an officer throughout his career, showed a significant effect on selection when 2 or more personal awards had been awarded to that officer. The precedence of the award (CMH vs Navy Achievement) was not considered. There was also no way to determine if an award was presented at the present paygrade. The two categories for medals were, then: TWO OR MORE, and LESS THAN TWO.

APPROPRIATE LEVEL SCHOOL: The Department of Defense manages (through the separate services) numerous professional military schools appropriate to each rank. Captains are selected and attend Amphibious

Warfare School, Advanced Infantry, Artillery, or Armor School (depending on MOS), etc. Majors likewise attend a school appropriate to their rank, as do Lt.Cols. The list of schools is lengthy and irrelevant. What is important, is that an officer attended a school appropriate to his rank. The two categories are YES or NO.

COMBAT SERVICE: The Marine Corps being the nation's force in readiness, I was interested in whether participation in combat or expeditionary service enhanced selection opportunity. Service from Vietnam through the Persian (Saudi) Gulf are included in the data, but again, the categorical YES or NO indicates whether the officer had combat service.

The following tables show the variables used in the analysis with the appropriate statistics used in selection of a variable for the model:

TO MAJOR (SELECTION RATE = 65.55%)

VARIABLE (DF)	SELECTION RATE	CHI-SQUARE	P - VALUE
RACE (1)	WHITE: 66.05% NONWHITE: 58.84%	6.289	.012
SEX (1)	MALE: 65.90% FEMALE: 57.39%	5.416	.020
DEGREE (1)	ADVANCED: 70.02% UNDERGRD: 64.45%	9.107	.003
OCCFIELD (4)	COMBAT ARMS: 63.27% FIX WING: 54.39% RTRY WING: 68.02% NFO: 67.15% SUPPORT: 66.47%	9.099	.059
DUTY STATION (4)	FMF: 63.13% NON FMF: 66.45% HQMC: 67.62% RECRTNG: 79.71% QUANTICO: 62.20%	11.235	.024
GCT (1)	HIGH: 66.95% LOW: 63.23%	6.032	.014
MARITAL STATUS (1)	MARRIED: 67.38% SINGLE: 54.27%	38.378	.000
COMBAT (1)	YES: 59.34% NO: 65.92%	4.366	.037
COMMISSION SOURCE (2)	USNA: 70.37% ROTC: 60.82% OCS: 65.95%	11.099	.004
MEDALS (1)	2 OR MORE: 84.00% LESS THAN 2: 62.76%	95.457	.000
ALS (1)	YES: 82.55% NO: 63.40%	67.795	.000

TO LT. COLONEL (SELECTION RATE = 52.86%)

VARIABLE (DF)	SELECTION RATE	CHI-SQUARE	P - VALUE
RACE (1)	WHITE: 53.26% NONWHITE: 45.89%	4.263	.039
SEX (1)	MALE: 53.15% FEMALE: 41.84%	4.905	.027
DEGREE (1)	ADVANCED: 60.72% UNDERGRD: 48.73%	49.379	.000
OCCFIELD (4)	COMBAT ARMS: 56.60% FIX WING: 30.77% RTRY WING: 54.17% NFO: 52.00% SUPPORT: 50.74%	25.43	.000
DUTY STATION (4)	FMF: 52.31% NON FMF: 53.73% HQMC: 58.55% RECRTNG: 66.17% QUANTICO: 29.73%	39.536	.000
GCT (1)	HIGH: 54.73% LOW: 48.08%	13.597	.000
MARITAL STATUS (1)	MARRIED: 53.84% SINGLE: 43.06%	14.66	.000
COMBAT (1)	YES: 49.74% NO: 53.21%	1.660	.198
COMMISSION SOURCE (2)	USNA: 62.22% ROTC: 62.76% OCS: 51.19%	24.521	.000
MEDALS (1)	2 OR MORE: 66.28% LESS THAN 2: 48.94%	79.991	.000
ALS (1)	YES: 67.93% NO: 47.44%	124.409	.000

TO COLONEL (SELECTION RATE = 40.86%)

VARIABLE (DF)	SELECTION RATE	CHI-SQUARE	P - VALUE
RACE (1)	WHITE: 40.94% NONWHITE: 37.78%	0.181	.670
SEX (1)	MALE: 41.00% FEMALE: 33.33%	0.716	.398
DEGREE (1)	ADVANCED: 47.07% UNDERGRD: 35.90%	21.134	.000
OCCFIELD (4)	COMBAT ARMS: 43.41% FIX WING: 25.81% RTRY WING: 36.84% NFO: 38.46% SUPPORT: 40.96%	6.256	.181
DUTY STATION (4)	FMF: 43.73% NON FMF: 38.28% HQMC: 54.84% RECRTNG: 58.82% QUANTICO: 28.45%	18.867	.001
GCT (1)	HIGH: 42.86% LOW: 35.54%	7.2917	.007
MARITAL STATUS (1)	MARRIED: 41.65% SINGLE: 27.66%	7.183	.007
COMBAT (1)	YES: 38.61% NO: 42.46%	2.472	.116
COMMISSION SOURCE (2)	USNA: 48.28% ROTC: 47.46% OCS: 39.70%	5.5511	.062
MEDALS (1)	2 OR MORE: 41.84% LESS THAN 2: 39.83%	0.697	.404
ALS (1)	YES: 55.85% NO: 26.16%	151.089	.000

V. MODEL DEVELOPMENT

Categorical Data Analysis is a proper tool for use with much military data, especially modeling manpower trends. The purpose of such model fitting is to smooth the data in order to remove transient effects and enhance interpretation, and to develop understanding of the factors that contribute to variability.

A log linear model of the filtered factors including select vs. nonselect (response) was used to help in the modeling. The goal is to find factors correlated with the first factor (select/nonselect). Any factor not correlated to that factor was discarded. This was the initial screening for the model. Specifically, the CSS Statistica software package was used to conduct this initial screening. Factors entered as candidates were selected as previously discussed in this analysis. [Ref. 5] Main effects and significant interactions between those effects were studied and, where appropriate, included in the model(s).

The next step in the model building was to harness the S+ Software in order to perform the categorical step-wise modeling procedures. N-way tables were constructed and the ratio of select/nonselect counts were used as response. Residuals for this type of LOGIT analysis appeared to be normally distributed. Such modeling produces an estimate of the odds favoring selection for each cell. A cell is a specific set of cross classifications of the chosen factors.

As an example, consider the basic model

$$ODDS_{ijk} = e^{\mu + \alpha_i + \beta_j + \gamma_k + \theta_{ijk}}$$

where μ is the intercept term, α, β, γ are the main effects terms, and θ represents the interaction between main effects.

It has main effects and interaction terms denoted by single and multiple subscripts respectively. Specific values for each model are discussed later in this analysis.

VI. MODEL ANALYSIS

The variables used in developing each model were determined by selection of the variables with the lowest p-values for each paygrade. All models were developed using the Generalized Linear Model (GLM) function in the S+ language. "The generalized linear model requires two functions:

* a link function that describes how the mean depends on linear predictors,

$$g(\mu) = \beta^T x \quad \text{, and}$$

* a variance function that captures how the variance of y depends upon the mean, with

$$var(y) = \phi V(\mu) \quad \text{, with } \phi \text{ constant." [Ref. 4]}$$

For the binary response variable, the logit model defines the proportion

$$\mu = \frac{e^{\eta}}{1 + e^{\eta}}$$

Where $\eta = \mu + \alpha_i + \beta_j + \gamma_k + \theta_{ijk}$

and guarantees that the proportion is between (0,1).

The loglinear model that was developed for each model took the notational form $\log\mu_{ijk} = \alpha + \beta^i + \beta^j + \beta^k$ where the superscript refers to the factor, and subscripts, if applicable, to the level of the factor.

The promotion models were developed using a log-linear stepwise regression in CSS Statistica software to determine main effects and interaction effects between variables on the response of selected or not selected for promotion. Once the models were developed, a maximum likelihood statistic was noted, a relevant p-value determined and the model then put into the S+ software to determine coefficients for each main effect and interaction effect. The modern parameterization technique is used by this software. That is, one level of each factor is used for reference and its coefficient is taken as zero. (an unmarried candidate for colonel has coefficient zero) A backwards stepwise regression (logistic regression) was executed for each paygrade using the variables up to and including all three way interactions (CSS Statistica showed no pertinent four way interactions), and the following models were generated:

TO COLONEL: The variables selected to build this model are Marital Status, Duty Station, Appropriate Level School and Degree.

VARIABLE	COEFFICIENT	t - VALUE
MU	-1.586	-5.024
MARRIED	0.458	1.818
ADV DEGREE	0.217	1.356
ALS ATTENDED	1.413	4.721
FMF DUTY	0.176	1.972
QUANTICO DUTY	-0.140	-0.741
HQMC DUTY	-0.126	-1.156
RECRUITING DUTY	0.134	0.888
ALS & ADV DEGREE	0.339	1.566
ALS & FMF DUTY	-0.117	-0.947
ALS & QUANTICO	-0.034	-0.137
ALS & HQMC	0.421	3.089
ALS & RECRUITING	0.096	0.429

The t statistics from this first model shows that the really significant effects are those with a t value beyond ±2 (appropriate level school, the interaction between ALS and HQMC duty). Also, notice the effect marital status and possession of an advanced degree has on the selection rate.

TO LIEUTENANT COLONEL: **The variables selected for this model were Marital Status, Degree, Commission Source, Duty Station, and Appropriate Level School.**

VARIABLE	COEFFICIENT	t - VALUE
MU	-0.102	-0.381
MARRIED	0.000	0.002
ADV DEGREE	0.840	3.568
ALS ATTENDED	0.463	1.736
FMF DUTY	0.485	4.947
NON FMF DUTY	0.199	5.549
HQMC DUTY	0.132	3.445
RECRUITING DUTY	0.144	2.370
USNA GRADUATE	0.770	2.924
ROTC GRADUATE	0.068	0.384
MARRIED & USNA	-0.605	-2.223
MARRIED & ROTC	0.011	0.064
MARRIED & ALS	0.460	1.644
MARRIED & ADV DEG	-0.408	-1.652

Of note in this model are the effects, of duty station), advanced degree, and appropriate level school. The effect of a Naval Academy commission is also significant.

TO MAJOR: The variables selected for this model are Marital Status, Degree, Commissioning Source, Medals, and Appropriate Level School.

VARIABLE	COEFFICIENT	t - VALUE
MU	-0.073	-0.757
MARRIED	0.544	5.855
ALS ATTENDED	1.007	7.875
ADVANCED DEGREE	0.223	2.581
USNA GRADUATE	0.128	2.063
ROTC GRADUATE	-0.159	-4.494
MEDALS $\geq$ 2	1.045	6.592
USNA & MEDALS $\geq$ 2	-0.362	-1.959
ROTC & MEDALS $\geq$ 2	0.331	2.825

The variables in this model are all significant.

The models were all fit initially using the CSS Statistics software package. The p - values associated with the fit of the models are:

TO COLONEL:	Max Likelihood Chi- Square	.8992
	Pearson Chi- Square	.9865
TO LT. COL:	Max Likelihood Chi- Square	.1979
	Pearson Chi- Square	.5765
TO MAJOR:	Max Likelihood Chi- Square	.9175
	Pearson Chi- Square	.9930

With the exception of the Max Likelihood Chi- Square value for the TO LT. COLONEL model, all models have very high p - values, indicating the relative fit of the model. Even lower readings could be used for not rejecting the null hypothesis

that the model provides a 'good' fit for predicting selection to Lt. Col. To facilitate selection, the number of variables was intentionally kept at five or fewer. More variables would have provided a better fit in each case, but overfitting the model was not the objective of this analysis.

Residual plots were prepared for each model. Minor transformation of the data was done to provide cell counts for each variable and factor within the variables. All residuals appeared to be normally distributed (random about 0). Of note, the horizontal axis was scaled from 0 to 1, and showed concentrations about the value one would expect for each pay grade. For example, the TO COLONEL data was randomly distributed above and below 0 on the vertical axis, but was centered roughly at a point to the left of the center on the horizontal axis, about 40% of the way along the horizontal, corresponding to the selection rate for that data. Similar observations were noted for the other two models.

The models for each paygrade are shown in Appendices [B,C,D]. Examples of how the models are used, i.e., how an officer's odds for selection are affected by inclusion or exclusion of certain variables are shown in Appendix [A].

VII. CONCLUSIONS

The selection rates predicted by the model are not always the same as the selection rates of the specified population. Small population size and model smoothing (only using five main effects to describe the officer i.e., not overfitting the model) are two reasons for the disparity. The fitted odds, however, show a direct comparison to one officer's chances for promotion over another. What is important, though, is that the magnitude of the rates and their ordering is consistent throughout the population. The model consistently forecasts that officer A is more likely to be promoted than officer B, given inclusion or exclusion of variables. These forecasts reflect the same trends and magnitudes of the population. If the model forecasts a higher than average rate, it is validated by the data, if the model predicts an officer is significantly more likely to be selected than another officer, the data supports that also. Actual rates computed for a random number of officers shows anywhere from a 1% to a 14% difference between model and data, but the direction of rates by cell were consistent.

Comparison of all the models shows some variables are consistent throughout the career pattern of the officers in the population: Marital Status, attendance at an Appropriate Level School, and Advanced Degree. Differences exist also between paygrades which account for differences in what promotion boards look for. Personal awards are usually awarded to junior officers for meritorious performance, whereas,

more senior officers receive them as "end of tour awards," hence decreasing their importance. Duty station and commissioning source play a factor in the model, perhaps validating the service academy's claims as to the value of an academy education. Duty station choice or assignment also carries significant weight in the selection process. Assignment to "high pressure - high visibility" billets enhances one's opportunity for recognition and promotability; assignment to less glamorous duty usually indicates career termination, and again, such interpretations appear to be validated by the model.

This model can be used by career planners, monitors and manpower planners at the HQMC level to assist officers in developing and planning for their career opportunities. Likewise, the individual officer can use this model to determine potential assignments, career enhancement opportunities, or career decisions. With the RIFs and drawdowns mandated by congress, this model can be used as a decision aid for officers faced with the choice of awaiting the next promotion board and receiving advancement, choosing retirement, or any incentive offered by the Marine Corps for an early departure from the Corps.

As with any model, constant refinement is required. This model was designed using data from 1986 - 1992, before the mandated reductions. Current officer assignment policies and mandates from DOD may change what is considered important for the selection process. Specifically, Joint Assignments were not included in this study (lack of data), and no distinction was made between Masters Degrees (or above) from a formal Special Education Program (SEP) such as NPS and a

degree achieved on an officer's off duty time. Command time was not a factor in the analysis, nor was the proportion of time spent in one's PMOS vs the proportion of time spent in "B" billets.

APPENDIX A

MODEL APPLICATION

The basic model with zero values for certain levels of main effects and other levels of interaction effects gives promotion odds equal to e^{μ} (see Example 3). Adding main effects and interaction terms gives the user the opportunity to predict the odds of promotion based on an officer's profile as described by the parameters of the model. Specific profiles and comparisons with selection rates for the profile populations are illustrated below:

EXAMPLE 1: Single, Captain USNA Graduate, 2 personal awards, AWS

$$e^{-.073 + 1.007 + 1.044 + .128}$$

graduate. The odds of promotion for this officer are 8.22, and we see the selection rate for this officer (from the model) is 89%. The actual promotion rate for officers fitting this particular profile is 100%. It appears that the author was only one of two officers in the entire population fitting this particular profile. Another case may come from another captain with the following profile:

EXAMPLE 2: Married, OCS graduate, without any appropriate level school:

$$e^{-.073 + .544}$$

This officer's odds of promotion are 1.60 with the attendant selection rate equal to 62%. The actual selection rate for officers fitting this description is 63%.

EXAMPLE 3: For a single captain with no appropriate level school, no awards, no advanced degree and an OCS product (our basic officer profile), the odds are even less:

$$e^{-.073}$$

which comes to .93 with an attendant selection rate of 48%. Comparing this rate with the actual selection rate of the population matching this profile (48%) shows a comparable forecast.

In each case presented above, we see the proximity of selection rates between the model and the officers actually in the specified profile. Similar comparisons for selection to Lt. Colonel and Colonel produce comparable results. Inclusion of further examples in this appendix would serve no useful purpose. The user of the model should be able to select the appropriate statistic(s) and preform the calculations required for prediction of selection rates and odds.

APPENDIX B

COEFFICIENTS FOR SELECTION TO MAJOR

The following table contains the coefficients, standard errors and t-statistic for promotion to major.

	COEFF	STD.ERR	t-STAT
MU	-0.0729528	0.09630872	-0.757489
MARRIED	0.5442202	0.09294570	5.855249
ALS ATTENDED	1.0069431	0.12786304	7.875169
ADV DEGREE	0.2232269	0.08646898	2.581584
USNA GRADUATE	0.1282185	0.06212491	2.063882
ROTC GRADUATE	-0.1587932	0.03532910	-4.494687
2 OR MORE MEDALS	1.0446696	0.15847396	6.592058
USNA W/2+ MEDALS	-0.3617219	0.18465107	-1.958948
ROTC W/2+ MEDALS	0.3310628	0.11717517	2.825367

* The converse of all single variables have a 0.00 coefficient. So does OCS W/2+ MEDALS, as well as any combination of LESS THAN 2 MEDALS with any Commissioning Source.

Residuals

Minimum	1Q	Median	3Q	Maximum
-1.4992	-.4352	.0879	.4732	2.2648

APPENDIX C

COEFFICIENTS FOR SELECTION TO LT. COL

The following table shows the coefficients, standard errors and t-statistics for the variables in the promotion model to lt. colonel.

	COEFF	STD.ERR	t-STAT
MU	-0.1017158961	0.26694553	-0.381036141
MARRIED	0.0005887876	0.26771261	0.002199327
ADV DEGREE	0.8403433743	0.23548927	3.568499704
ALS	0.4642850385	0.26742081	1.736158987
FMF	0.4849356694	0.09803029	4.946794397
NON FMF	0.1987669151	0.03582122	5.548859052
HQMC	0.1315438830	0.03818185	3.445194495
RECRUITING	0.1442370844	0.06085863	2.370034963
USNA GRAD	0.7699281943	0.26330155	2.924130939
ROTC GRAD	0.0681611734	0.17729602	0.384448418
MARRIED/USNA	-0.6053423996	0.27228759	-2.223172941
MARRIED/ROTC	0.0118408638	0.18396973	0.064363109
MARRIED & ALS	0.4603772670	0.28003619	1.643992040
MARRIED & DEG	-0.4083980928	0.24718746	-1.652179680

* All main effect variable converses have a 0.00 coefficient. A 0.00 coefficient is assigned to the duty station QUANTICO. All interactions converse (NOT MARRIED/***) and the MARRIED/QUANTICO interaction have a 0.00 coefficient.

Residuals

Min	1Q	Median	3Q	Max
-2.3499	-.4548	-.0151	.5828	2.7262

APPENDIX D

COEFFICIENTS FOR SELECTION TO LT. COL

Table identifying the coefficients, standard error, and t-statistic for promotion to colonel.

	COEFF	STD.ERR	t-STAT
MU	-1.58586346	0.31568854	-5.0235065
MARRIED	0.45787837	0.25190811	1.8176404
ADV DEGREE	0.21717522	0.16018293	1.3557950
ATTENDED ALS	1.41267472	0.29920843	4.7213734
FMF DUTY	0.17664003	0.08957335	1.9720153
QUATNICO DUTY	-0.14026739	0.18919175	-0.7414033
HQMC DUTY	-0.12611591	0.10911354	-1.1558227
RECRUIT DUTY	0.13371143	0.15049187	0.8884960
ALS & DEG	0.33891764	0.21636010	1.5664517
ALS & FMF	-0.11665806	0.12312696	-0.9474616
ALS & QUANTICO	-0.03429735	0.25122907	-0.1365182
ALS & HQMC	0.42124259	0.13634020	3.0896433
ALS & REC DUTY	0.09574254	0.22288613	0.4295581

* The following variables have 0.00 as a coefficient:

Not Married
Undergraduate Degree
No ALS
Non FMF Duty Station
Any combination of No ALS and any Duty Station
ALS and Non FMF Duty

Residuals

Minimum	1Q	Median	3Q	Maximum
-1.3306	-.5419	.0001	.3549	1.9098

APPENDIX E

CROSSTABULATION TABLES FOR PROMOTION TO MAJOR

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 2244	OCS 1671	USNA 230	ROTC 343
N Y	861 1383	625 1046	74 156	162 181

X:SELECT; Y:SOURCE
chi2=16.; df=2; p=.000

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 2244	OCS 74.5	USNA 10.2	ROTC 15.3
N Y	38.4 61.6	37.4 62.6	32.2 67.8	47.2 52.8

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 542	OCS 392	USNA 51	ROTC 99
N Y	182 360	127 265	12 39	43 56

X:SELECT; Y:SOURCE
chi2=7.; df=2; p=.033

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 542	OCS 72.	USNA 9.4	ROTC 18.
N Y	34. 66.	32. 68.	24. 76.	43. 57.

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 309	OCS 215	USNA 35	ROTC 59
N Y	57 252	38 177	12 23	7 52

X:SELECT; Y:SOURCE
chi2=8.; df=2; p=.022; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 309	OCS 70.	USNA 11.	ROTC 19.
N Y	18. 82.	18. 82.	34. 66.	12. 88.

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 111	OCS 74	USNA 11	ROTC 26
N Y	14 97	13 61	0 11	1 25

X:SELECT; Y:SOURCE
chi2=5.; df=2; p=.081; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 111	OCS 67.	USNA 9.9	ROTC 23.
N Y	13. 87.	18. 82.	0 100	3.8 96.

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 390	OCS 301	USNA 30	ROTC 59
N Y	203 187	159 142	15 15	29 30

X:SELECT; Y:SOURCE
chi2=.3212; df=2; p=.852

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 390	OCS 77.	USNA 7.7	ROTC 15.
N Y	52. 48.	53. 47.	50 50	49. 51.

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 75	OCS 63	USNA 4	ROTC 8
N Y	34 41	27 36	3 1	4 4

X:SELECT; Y:SOURCE
chi2=2.; df=2; p=.439; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 75	OCS 84	USNA 5.3	ROTC 11.
N Y	45. 55.	43. 57.	75 25	50 50

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 40	OCS 33	USNA 3	ROTC 4
N Y	8 32	6 27	1 2	1 3

X:SELECT; Y:SOURCE
chi2=.4640; df=2; p=.793; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 40	OCS 83.	USNA 7.5	ROTC 10
N Y	20 80	18. 82.	33. 67.	25 75

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 13	OCS 5	USNA 0	ROTC 8
N Y	4 9	1 4	0 0	3 5

X:SELECT; Y:SOURCE
chi2=.0023; df=1; p=.962; Nij<5

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 13	OCS 38.	USNA 0	ROTC 62.
N Y	31. 69.	20 80	0 0	38. 63.

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 285	OCS 223	USNA 22	ROTC 40
N Y	55 230	44 179	2 20	9 31

X:SELECT; Y:SOURCE
chi2=2.; df=2; p=.415; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 285	OCS 78.	USNA 7.7	ROTC 14.
N Y	19. 81.	20. 80.	9.1 91.	23. 78.

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 55	OCS 35	USNA 9	ROTC 11
N Y	7 48	3 32	1 8	3 8

X:SELECT; Y:SOURCE
chi2=3.; df=2; p=.265; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 55	OCS 64.	USNA 16.	ROTC 20
N Y	13. 87.	8.6 91.	11. 89.	27. 73.

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 48	OCS 31	USNA 4	ROTC 13
N Y	1 47	0 31	0 4	1 12

X:SELECT; Y:SOURCE
chi2=3.; df=2; p=.253; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 48	OCS 65.	USNA 8.3	ROTC 27.
N Y	2.1 98.	0 100	0 100	7.7 92.

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 16	OCS 13	USNA 2	ROTC 1
N Y	2 14	2 11	0 2	0 1

X:SELECT; Y:SOURCE
chi2=.5275; df=2; p=.768; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 16	OCS 81.	USNA 13.	ROTC 6.3
N Y	13. 88.	15. 85.	0 100	0 100

cas/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 42	OCS 34	USNA 2	ROTC 6
N Y	11 31	9 25	0 2	2 4

X:SELECT; Y:SOURCE
chi2=.8694; df=2; p=.648; Nij<10

cas/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 42	OCS 81.	USNA 4.8	ROTC 14.
N Y	26. 74.	26. 74.	0 100	33. 67.

cas/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 11	OCS 11	USNA 0	ROTC 0
N Y	4 7	4 7	0 0	0 0

X:SELECT; Y:SOURCE; NO STATS
3 or less cases or 1 col or 1 row

cas/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & MEDALS=LESSTH2 & DEGREE=ADVANCED		
SELECT	SOURCE 11	OCS 100	USNA 0	ROTC 0
N Y	36. 64.	36. 64.	0 0	0 0

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 12	OCS 8	USNA 2	ROTC 2
N Y	2 10	1 7	0 2	1 1

X:SELECT; Y:SOURCE
chi2=2.; df=2; p=.350; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & MEDALS=MORETH2 & DEGREE=UNDRGRAD		
SELECT	SOURCE 12	OCS 67.	USNA 17.	ROTC 17.
N Y	17. 83.	13. 88.	0 100	50 50

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 1	OCS 1	USNA 0	ROTC 0
N Y	0 1	0 1	0 0	0 0

X:SELECT; Y:SOURCE; NO STATS
3 or less cases or 1 col or 1 row

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & MEDALS=MORETH2 & DEGREE=ADVANCED		
SELECT	SOURCE 1	OCS 100	USNA 0	ROTC 0
N Y	0 100	0 100	0 0	0 0

APPENDIX F

CROSS TABULATION TABLES FOR SELECTION TO LT. COLONEL

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 145	QUA 59	FMF 407	NON 903	HQM 70	REC 19
N	832	48	238	502	38	6
Y	626	11	169	401	32	13

X:SELECTED; Y:DUTYSTA
chi2=21.; df=4; p=.000; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 145	QUA 4.0	FMF 28.	NON 62.	HQM 4.8	REC 1.3
N	57.	81.	58.	56.	54.	32.
Y	43.	19.	42.	44.	46.	68.

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 694	QUA 17	FMF 180	NON 437	HQM 48	REC 12
N	311	11	78	202	14	6
Y	383	6	102	235	34	6

X:SELECTED; Y:DUTYSTA
chi2=8.; df=4; p=.088; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & SOURCE=M & DEGREE=ADVANCED				
SELECTED	DUTYSTA 694	QUA 2.4	FMF 26.	NON 63.	HQM 6.9	REC 1.7
N	45.	65.	43.	46.	29.	50
Y	55.	35.	57.	54.	71.	50

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 104	QUA 3	FMF 30	NON 64	HQM 7	REC 0
N	52	1	21	26	4	0
Y	52	2	9	38	3	0

X:SELECTED; Y:DUTYSTA
chi2=8.; df=3; p=.058; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 104	QUA 2.9	FMF 29.	NON 62.	HQM 6.7	REC 0
N	50	33.	70	41.	57.	0
Y	50	67.	30	59.	43.	0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 83	QUA 4	FMF 17	NON 54	HQM 7	REC 1
N	32	3	7	20	2	0
Y	51	1	10	34	5	1

X:SELECTED; Y:DUTYSTA
chi2=3.; df=4; p=.515; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 83	QUA 4.8	FMF 20.	NON 65.	HQM 8.4	REC 1.2
N	39.	75	41.	37.	29.	0
Y	61.	25	59.	63.	71.	100

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 119	QUA 3	FMF 37	NON 73	HQM 5	REC 1
N	55	0	21	32	1	1
Y	64	3	16	41	4	0

X:SELECTED; Y:DUTYSTA
chi2=7.; df=4; p=.140; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 119	QUA 2.5	FMF 31.	NON 61.	HQM 4.2	REC .8
N	46.	0	57.	44.	20	100
Y	54.	100	43.	56.	80	0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=M & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 70	QUA 2	FMF 26	NON 37	HQM 5	REC 0
N	30	2	13	13	2	0
Y	40	0	13	24	3	0

X:SELECTED; Y:DUTYSTA
chi2=4.; df=3; p=.249; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=M & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 70	QUA 2.9	FMF 37.	NON 53.	HQM 7.1	REC 0
N	43.	100	50	35.	40	0
Y	57.	0	50	65.	60	0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 140	QUA 6	FMF 35	NON 83	HQM 11	REC 5
N	98	4	25	58	8	3
Y	42	2	10	25	3	2

X:SELECTED; Y:DUTYSTA
chi2=.3434; df=4; p=.987; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 140	QUA 4.3	FMF 25	NON 59.	HQM 7.9	REC 3.6
N	70	67.	71.	70.	73.	60
Y	30	33.	29.	30.	27.	40

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 87	QUA 9	FMF 22	NON 47	HQM 9	REC 0
N	46	6	11	24	5	0
Y	41	3	11	23	4	0

X:SELECTED; Y:DUTYSTA
chi2=.8478; df=3; p=.838; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 87	QUA 10.	FMF 25.	NON 54.	HQM 10.	REC 0
N	53.	67.	50	51.	56.	0
Y	47.	33.	50	49.	44.	0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 6	QUA 0	FMF 0	NON 4	HQM 2	REC 0
N	2	0	0	1	1	0
Y	4	0	0	3	1	0

X:SELECTED; Y:DUTYSTA
chi2=0; df=1; p=1; Nij<5

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 6	QUA 0	FMF 0	NON 67.	HQM 33.	REC 0
N	33.	0	0	25	50	0
Y	67.	0	0	75	50	0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 11	QUA 0	FMF 2	NON 7	HQM 2	REC 0
N	2	0	1	1	0	0
Y	9	0	1	6	2	0

X:SELECTED; Y:DUTYSTA
chi2=2.; df=2; p=.392; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 11	QUA 0	FMF 18.	NON 64.	HQM 18.	REC 0
N	18.	0	50	14.	0	0
Y	82.	0	50	86.	100	0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 12	QUA 0	FMF 2	NON 10	HQM 0	REC 0
N Y	7 5	0 0	2 0	5 5	0 0	0 0

X:SELECTED; Y:DUTYSTA
chi2=.2743; df=1; p=.601; Nij<5

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 12	QUA 0	FMF 17.	NON 83.	HQM 0	REC 0
N Y	58. 42.	0 0	100 0	50 50	0 0	0 0

css/3: tables		Crosstabulation (count) For: ALS=N & MARSTAT=S & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 7	QUA 0	FMF 0	NON 6	HQM 1	REC 0
N Y	0 7	0 0	0 0	0 6	0 1	0 0

X:SELECTED; Y:DUTYSTA
3 or less cases or 1 col or 1 row

css/3: tables		Crosstabulation (% column) For: ALS=N & MARSTAT=S & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 7	QUA 0	FMF 0	NON 86.	HQM 14.	REC 0
N Y	0 100	0 0	0 0	0 100	0 100	0 0

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 511	QUA 24	FMF 161	NON 290	HQM 34	REC 2
N	180	16	54	96	14	0
Y	331	8	107	194	20	2

X:SELECTED; Y:DUTYSTA
chi2=13.; df=4; p=.013; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 511	QUA 4.7	FMF 32.	NON 57.	HQM 6.7	REC .4
N	35.	67.	34.	33.	41.	0
Y	65.	33.	66.	67.	59.	100

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 270	QUA 11	FMF 93	NON 145	HQM 17	REC 4
N	72	7	22	41	1	1
Y	198	4	71	104	16	3

X:SELECTED; Y:DUTYSTA
chi2=12.; df=4; p=.017; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 270	QUA 4.1	FMF 34.	NON 54.	HQM 6.3	REC 1.5
N	27.	64.	24.	28.	5.9	25
Y	73.	36.	76.	72.	94.	75

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 37	QUA 1	FMF 12	NON 21	HQM 3	REC 0
N	11	1	5	3	2	0
Y	26	0	7	18	1	0

X:SELECTED; Y:DUTYSTA
chi2=8.; df=3; p=.057; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 37	QUA 2.7	FMF 32.	NON 57.	HQM 8.1	REC 0
N	30.	100	42.	14.	67.	0
Y	70.	0	58.	86.	33.	0

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 23	QUA 0	FMF 7	NON 12	HQM 4	REC 0
N	2	0	0	1	1	0
Y	21	0	7	11	3	0

X:SELECTED; Y:DUTYSTA
chi2=2.; df=2; p=.367; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 23	QUA 0	FMF 30.	NON 52.	HQM 17.	REC 0
N	8.7	0	0	8.3	25	0
Y	91.	0	100	92.	75	0

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 46	QUA 3	FMF 12	NON 25	HQM 4	REC 2
N Y	8 38	2 1	2 10	2 23	2 2	0 2

X:SELECTED; Y:DUTYSTA
chi2=11.; df=4; p=.041; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 46	QUA 6.5	FMF 26.	NON 54.	HQM 8.7	REC 4.3
N Y	17. 83.	67. 33.	17. 83.	8 92	50 50	0 100

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=M & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 34	QUA 2	FMF 13	NON 16	HQM 0	REC 3
N Y	7 27	2 0	3 10	2 14	0 0	0 3

X:SELECTED; Y:DUTYSTA
chi2=9.; df=3; p=.027; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=M & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 34	QUA 5.9	FMF 38.	NON 47.	HQM 0	REC 8.8
N Y	21. 79.	100 0	23. 77.	13. 88.	0 0	0 100

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 51	QUA 4	FMF 14	NON 29	HQM 3	REC 1
N	30	1	5	23	1	0
Y	21	3	9	6	2	1

X:SELECTED; Y:DUTYSTA
chi2=12.; df=4; p=.016; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & SOURCE=OCS & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 51	QUA 7.8	FMF 27.	NON 57.	HQM 5.9	REC 2.0
N	59.	25	36.	79.	33.	0
Y	41.	75	64.	21.	67.	100

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 24	QUA 0	FMF 9	NON 13	HQM 1	REC 1
N	10	0	6	3	1	0
Y	14	0	3	10	0	1

X:SELECTED; Y:DUTYSTA
chi2=6.; df=3; p=.100; Nij<10

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & SOURCE=OCS & DEGREE=ADVANCED				
SELECTED	DUTYSTA 24	QUA 0	FMF 38.	NON 54.	HQM 4.2	REC 4.2
N	42.	0	67.	23.	100	0
Y	58.	0	33.	77.	0	100

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 4	QUA 0	FMF 2	NON 2	HQM 0	REC 0
N	1	0	1	0	0	0
Y	3	0	1	2	0	0

X:SELECTED; Y:DUTYSTA
chi2=0; df=1; p=1; Nij<5

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & SOURCE=USNA & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 4	QUA 0	FMF 50	NON 50	HQM 0	REC 0
N	25	0	50	0	0	0
Y	75	0	50	100	0	0

css/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 2	QUA 0	FMF 0	NON 1	HQM 1	REC 0
N	0	0	0	0	0	0
Y	2	0	0	1	1	0

X:SELECTED; Y:DUTYSTA; NO STATS
3 or less cases or 1 col or 1 row

css/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & SOURCE=USNA & DEGREE=ADVANCED				
SELECTED	DUTYSTA 2	QUA 0	FMF 0	NON 50	HQM 50	REC 0
N	0	0	0	0	0	0
Y	100	0	0	100	100	0

cas/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 1	QUA 0	FMF 0	NON 1	HQM 0	REC 0
N	0	0	0	0	0	0
Y	1	0	0	1	0	0

X:SELECTED; Y:DUTYSTA; NO STATS
3 or less cases or 1 col or 1 row

cas/3: tables		Crosstabulation (% column) For: ALS=y & MARSTAT=s & SOURCE=ROTC & DEGREE=UNDRGRAD				
SELECTED	DUTYSTA 1	QUA 0	FMF 0	NON 100	HQM 0	REC 0
N	0	0	0	0	0	0
Y	100	0	0	100	0	0

cas/3: tables		Crosstabulation (count) For: ALS=Y & MARSTAT=S & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 1	QUA 0	FMF 1	NON 0	HQM 0	REC 0
N	1	0	1	0	0	0
Y	0	0	0	0	0	0

X:SELECTED; Y:DUTYSTA; NO STATS
3 or less cases or 1 col or 1 row

cas/3: tables		Crosstabulation (% column) For: ALS=Y & MARSTAT=S & SOURCE=ROTC & DEGREE=ADVANCED				
SELECTED	DUTYSTA 1	QUA 0	FMF 100	NON 0	HQM 0	REC 0
N	100	0	100	0	0	0
Y	0	0	0	0	0	0

APPENDIX G

CROSSTABULATION TABLES FOR PROMOTION TO COLONEL

css/3: tables		Crosstabulation (count) For: MARSTAT=M & ALS=Y & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 415	NON 267	FMF 101	QUA 12	HQM 29	REC 6
N	209	142	52	7	6	2
Y	206	125	49	5	23	4

X:SELECT; Y:DUTYSTA
chi2=12.; df=4; p=.017; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=M & ALS=Y & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 415	NON 64.	FMF 24.	QUA 2.9	HQM 7.0	REC 1.4
N	50.	53.	51.	58.	21.	33.
Y	50.	47.	49.	42.	79.	67.

css/3: tables		Crosstabulation (count) For: MARSTAT=M & ALS=Y & DEGREE=ADVANCED				
SELECT	DUTYSTA 371	NON 227	FMF 90	QUA 5	HQM 47	REC 2
N	135	89	32	3	11	0
Y	236	138	58	2	36	2

X:SELECT; Y:DUTYSTA
chi2=7.; df=4; p=.161; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=M & ALS=Y & DEGREE=ADVANCED				
SELECT	DUTYSTA 371	NON 61.	FMF 24.	QUA 1.3	HQM 13.	REC .5
N	36.	39.	36.	60	23.	0
Y	64.	61.	64.	40	77.	100

css/3: tables		Crosstabulation (count) For: MARSTAT=M & ALS=N & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 448	NON 306	FMF 110	QUA 10	HQM 17	REC 5
N	336	234	77	9	13	3
Y	112	72	33	1	4	2

X:SELECT; Y:DUTYSTA
chi2=4.; df=4; p=.457; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=M & ALS=N & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 448	NON 68.	FMF 25.	QUA 2.2	HQM 3.8	REC 1.1
N	75	76.	70	90	76.	60
Y	25	24.	30	10	24.	40

css/3: tables		Crosstabulation (count) For: MARSTAT=M & ALS=N & DEGREE=ADVANCED				
SELECT	DUTYSTA 329	NON 214	FMF 83	QUA 7	HQM 22	REC 3
N	232	152	54	5	19	2
Y	97	62	29	2	3	1

X:SELECT; Y:DUTYSTA
chi2=4.; df=4; p=.421; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=M & ALS=N & DEGREE=ADVANCED				
SELECT	DUTYSTA 329	NON 65.	FMF 25.	QUA 2.1	HQM 6.7	REC .9
N	71.	71.	65.	71.	86.	67.
Y	29.	29.	35.	29.	14.	33.

css/3: tables		Crosstabulation (count) For: MARSTAT=S & ALS=Y & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 15	NON 8	FMF 5	QUA 1	HQM 0	REC 1
N	10	6	3	1	0	0
Y	5	2	2	0	0	1

X:SELECT; Y:DUTYSTA
chi2=3.; df=3; p=.416; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=S & ALS=Y & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 15	NON 53.	FMF 33.	QUA 6.7	HQM 0	REC 6.7
N	67.	75	60	100	0	0
Y	33.	25	40	0	0	100

css/3: tables		Crosstabulation (count) For: MARSTAT=S & ALS=Y & DEGREE=ADVANCED				
SELECT	DUTYSTA 19	NON 13	FMF 5	QUA 0	HQM 1	REC 0
N	8	6	2	0	0	0
Y	11	7	3	0	1	0

X:SELECT; Y:DUTYSTA
chi2=.8238; df=2; p=.663; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=S & ALS=Y & DEGREE=ADVANCED				
SELECT	DUTYSTA 19	NON 68.	FMF 26.	QUA 0	HQM 5.3	REC 0
N	42.	46.	40	0	0	0
Y	58.	54.	60	0	100	0

css/3: tables		Crosstabulation (count) For: MARSTAT=S & ALS=N & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 44	NON 28	FMF 10	QUA 2	HQM 4	REC 0
N	36	25	6	2	3	0
Y	8	3	4	0	1	0

X:SELECT; Y:DUTYSTA
chi2=5.; df=3; p=.186; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=S & ALS=N & DEGREE=UNDRGRAD				
SELECT	DUTYSTA 44	NON 64.	FMF 23.	QUA 4.5	HQM 9.1	REC 0
N	82.	89.	60	100	75	0
Y	18.	11.	40	0	25	0

css/3: tables			Crosstabulation (count) For: MARSTAT=S & ALS=N & DEGREE=ADVANCED			
SELECT	DUTYSTA 16	NON 8	FMF 3	QUA 1	HQM 4	REC 0
N	14	7	3	0	4	0
Y	2	1	0	1	0	0

X:SELECT; Y:DUTYSTA
chi2=8; df=3; p=.047; Nij<10

css/3: tables		Crosstabulation (% column) For: MARSTAT=S & ALS=N & DEGREE=ADVANCED				
SELECT	DUTYSTA 16	NON 50	FMF 19.	QUA 6.3	HQM 25	REC 0
N	88.	88.	100	0	100	0
Y	13.	13.	0	100	0	0

APPENDIX H

SAS CODE TO TRANSFORM DATA FROM ASCII TO CSS AND S+ READABLE DATA

```
OPTIONS LINESIZE = 80 PRINT = 'PETEYONE LISTING T';
     DATA ONE;


          INFILE 'LONGALL DATA *';
               INPUT FY 1-2

                     SELECTED $ 3
                     PRESRANK $ 4-5
                     SSN $7-15
                     MARSTAT $ 16
                     ETHNIC $ 17-24
                     SEX $ 44
                     PMOS $ 45-47
                     BMOS $ 49-52
                     MCC $ 53-55
                     SRCENTRY $ 56-57
                     EDLEVEL $ 60
                     GCT 61-63
                     LINEALNO 64-71
                     AWARD1 $ 72-74
                     AWARD2 $ 75-77
                     AWARD3 $ 78-80
                     AWARD4 $ 81-83
                     AWARD5 $ 84-86
                     AWARD6 $ 87-89
                     AWARD7 $ 90-92
                     AWARD8 $ 93-95
                     AWARD9 $ 96-98
                     AWARD10 $ 99-101
                     AWARD11 $ 102-104
                     AWARD12 $ 105-107
                     AWARD13 $ 108-110
                     SCHOOL1 $ 111-113
                     SCHOOL2 $ 114-116
                     SCHOOL3 $ 117
                     SCHOOL4 $ 118-120
                     SCHOOL5 $ 121-123
                     SCHOOL6 $ 124-126
                     SCHOOL7 $ 127-129
                     SCHOOL8 $ 130-132
```

```
                    SCHOOL9 $ 133-135
                    SCHOOL10 $ 136-138
                    SCHOOL11 $ 139-141
                    SCHOOL12 $ 142-144
                    COMBSVC $ 145
                    PRESDOR $ 150-155
                    YRCOMMSN $ 156-157;


IF ETHNIC = 'CAUCASIA' THEN RACE = 'WHITE';
    ELSE RACE = 'NONWHITE';

IF PMOS = '030' OR PMOS = '080' OR PMOS = '130' OR PMOS =
'180'
    THEN OCCFIELD = 'COMBTRMS';
ELSE IF PMOS = '755' THEN OCCFIELD = 'FXWING';
ELSE IF PMOS = '756' THEN OCCFIELD = 'RTRYWING';
ELSE IF PMOS = '758' THEN OCCFIELD = 'GIB';
ELSE OCCFIELD = 'SUPPORT';

    IF MCC='1C0' OR MCC='1DZ' OR MCC='1EF' OR MCC='1EG' OR
MCC='1EH' OR
       MCC='1ES' OR MCC='1ET' OR MCC='1EZ' OR MCC='1E1' OR
MCC='1FF' OR
       MCC='1FR' OR MCC='1F3' OR MCC='1F4' OR MCC='1F5' OR
MCC='1JA' OR
       MCC='1JC' OR MCC='1JE' OR MCC='1JM' OR MCC='105' OR
MCC='118' OR
       MCC='119' OR MCC='121' OR MCC='143' OR MCC='169' OR
MCC='182' OR
       MCC='184' OR
       MCC='1DH' OR MCC='1DK' OR MCC='1DN' OR MCC='1DY' OR
MCC='1D1' OR
       MCC='1D4' OR MCC='1EB' OR MCC='1EE' OR MCC='1E0' OR
MCC='1FA' OR
       MCC='1FB' OR MCC='1FT' OR MCC='1FS' OR MCC='1F1' OR
MCC='1F2' OR
       MCC='1JD' OR MCC='1JG' OR MCC='1JH' OR MCC='1JJ' OR
MCC='107' OR
       MCC='117' OR MCC='122' OR MCC='126' OR MCC='142' OR
MCC='151' OR
       MCC='160' OR MCC='165' OR MCC='175' OR MCC='185' OR
MCC='186' OR
       MCC='1C1' OR MCC='1C2' OR MCC='1D2' OR MCC='1FG' OR
MCC='1FP' OR
       MCC='1F6' OR MCC='1JB' OR MCC='1JF' OR MCC='1JL' OR
MCC='116' OR
       MCC='120' OR MCC='124' OR MCC='130' OR MCC='145' OR
MCC='146' OR
```

```
      MCC='174' OR MCC='181' OR MCC='183' THEN DUTYSTA =
'FMF';
  ELSE IF MCC = '012' THEN  DUTYSTA = 'QUANTICO';
  ELSE IF MCC = '010' THEN DUTYSTA = 'HQMC';
  ELSE IF SUBSTR(MCC,1,1) = 'A' OR SUBSTR(MCC,1,1) = '9'
  THEN DUTYSTA = 'RECRUTNG';
  ELSE DUTYSTA = 'NONFMF';


IF EDLEVEL= 'N' OR EDLEVEL= 'R' OR EDLEVEL= 'U' THEN DEGREE =
'ADVANCED';
   ELSE DEGREE = 'UNDRGRAD';
IF COMBSVC = '0' THEN COMBAT = 'NO';
   ELSE COMBAT = 'YES';



IF   AWARD2=:'AS'   OR   AWARD2=:'CA'   OR   AWARD2=:'BS'   OR
AWARD2=:'BV'
OR   AWARD2=:'CR'   OR   AWARD2=:'DS'   OR   AWARD2=:'MR'   OR
AWARD2=:'DF'
OR   AWARD2=:'DV'   OR   AWARD2=:'DM'   OR   AWARD2=:'DX'   OR
AWARD2=:'JA'
OR   AWARD2=:'JS'   OR   AWARD2=:'JV'   OR   AWARD2=:'LM'   OR
AWARD2=:'LV'
OR   AWARD2=:'MH'   OR   AWARD2=:'NM'   OR   AWARD2=:'NA'   OR
AWARD2=:'MV'
OR   AWARD2=:'CN'   OR   AWARD2=:'NV'   OR   AWARD2=:'NX'   OR
AWARD2=:'PH'
OR AWARD2=:'SS'
OR   AWARD3=:'AS'   OR   AWARD3=:'CA'   OR   AWARD3=:'BS'   OR
AWARD3=:'BV'
OR   AWARD3=:'CR'   OR   AWARD3=:'DS'   OR   AWARD3=:'MR'   OR
AWARD3=:'DF'
OR   AWARD3=:'DV'   OR   AWARD3=:'DM'   OR   AWARD3=:'DX'   OR
AWARD3=:'JA'
OR   AWARD3=:'JS'   OR   AWARD3=:'JV'   OR   AWARD3=:'LM'   OR
AWARD3=:'LV'
OR   AWARD3=:'MH'   OR   AWARD3=:'NM'   OR   AWARD3=:'NA'   OR
AWARD3=:'MV'
OR   AWARD3=:'CN'   OR   AWARD3=:'NV'   OR   AWARD3=:'NX'   OR
AWARD3=:'PH'
OR AWARD3=:'SS'
OR   AWARD4=:'AS'   OR   AWARD4=:'CA'   OR   AWARD4=:'BS'   OR
AWARD4=:'BV'
OR   AWARD4=:'CR'   OR   AWARD4=:'DS'   OR   AWARD4=:'MR'   OR
AWARD4=:'DF'
OR   AWARD4=:'DV'   OR   AWARD4=:'DM'   OR   AWARD4=:'DX'   OR
AWARD4=:'JA'
OR   AWARD4=:'JS'   OR   AWARD4=:'JV'   OR   AWARD4=:'LM'   OR
AWARD4=:'LV'
```

```
OR   AWARD4=:'MH'   OR   AWARD4=:'NM'   OR   AWARD4=:'NA'   OR
AWARD4=:'MV'
OR   AWARD4=:'CN'   OR   AWARD4=:'NV'   OR   AWARD4=:'NX'   OR
AWARD4=:'PH'
OR AWARD4=:'SS'
OR   AWARD5=:'AS'   OR   AWARD5=:'CA'   OR   AWARD5=:'BS'   OR
AWARD5=:'BV'
OR   AWARD5=:'CR'   OR   AWARD5=:'DS'   OR   AWARD5=:'MR'   OR
AWARD5=:'DF'
OR   AWARD5=:'DV'   OR   AWARD5=:'DM'   OR   AWARD5=:'DX'   OR
AWARD5=:'JA'
OR   AWARD5=:'JS'   OR   AWARD5=:'JV'   OR   AWARD5=:'LM'   OR
AWARD5=:'LV'
OR   AWARD5=:'MH'   OR   AWARD5=:'NM'   OR   AWARD5=:'NA'   OR
AWARD5=:'MV'
OR   AWARD5=:'CN'   OR   AWARD5=:'NV'   OR   AWARD5=:'NX'   OR
AWARD5=:'PH'
OR AWARD5=:'SS'
OR   AWARD6=:'AS'   OR   AWARD6=:'CA'   OR   AWARD6=:'BS'   OR
AWARD6=:'BV'
OR   AWARD6=:'CR'   OR   AWARD6=:'DS'   OR   AWARD6=:'MR'   OR
AWARD6=:'DF'
OR   AWARD6=:'DV'   OR   AWARD6=:'DM'   OR   AWARD6=:'DX'   OR
AWARD6=:'JA'
OR   AWARD6=:'JS'   OR   AWARD6=:'JV'   OR   AWARD6=:'LM'   OR
AWARD6=:'LV'
OR   AWARD6=:'MH'   OR   AWARD6=:'NM'   OR   AWARD6=:'NA'   OR
AWARD6=:'MV'
OR   AWARD6=:'CN'   OR   AWARD6=:'NV'   OR   AWARD6=:'NX'   OR
AWARD6=:'PH'
OR AWARD6=:'SS'
OR   AWARD7=:'AS'   OR   AWARD7=:'CA'   OR   AWARD7=:'BS'   OR
AWARD7=:'BV'
OR   AWARD7=:'CR'   OR   AWARD7=:'DS'   OR   AWARD7=:'MR'   OR
AWARD7=:'DF'
OR   AWARD7=:'DV'   OR   AWARD7=:'DM'   OR   AWARD7=:'DX'   OR
AWARD7=:'JA'
OR   AWARD7=:'JS'   OR   AWARD7=:'JV'   OR   AWARD7=:'LM'   OR
AWARD7=:'LV'
OR   AWARD7=:'MH'   OR   AWARD7=:'NM'   OR   AWARD7=:'NA'   OR
AWARD7=:'MV'
OR   AWARD7=:'CN'   OR   AWARD7=:'NV'   OR   AWARD7=:'NX'   OR
AWARD7=:'PH'
OR AWARD7=:'SS'
OR   AWARD8=:'AS'   OR   AWARD8=:'CA'   OR   AWARD8=:'BS'   OR
AWARD8=:'BV'
OR   AWARD8=:'CR'   OR   AWARD8=:'DS'   OR   AWARD8=:'MR'   OR
AWARD8=:'DF'
OR   AWARD8=:'DV'   OR   AWARD8=:'DM'   OR   AWARD8=:'DX'   OR
AWARD8=:'JA'
```

```
OR   AWARD8=:'JS'   OR   AWARD8=:'JV'   OR   AWARD8=:'LM'   OR
AWARD8=:'LV'
OR   AWARD8=:'MH'   OR   AWARD8=:'NM'   OR   AWARD8=:'NA'   OR
AWARD8=:'MV'
OR   AWARD8=:'CN'   OR   AWARD8=:'NV'   OR   AWARD8=:'NX'   OR
AWARD8=:'PH'
OR AWARD8=:'SS' THEN MEDALS = 'MORETHN2';
   ELSE MEDALS = 'LESSTH2';


IF PRESRANK = '04' AND
   SCHOOL3 ='RHA' OR SCHOOL3 = 'M3B' OR SCHOOL3 = 'T7A' OR
SCHOOL3 = 'RFE'
OR SCHOOL3 = 'RHB' OR
SCHOOL4 ='RHA' OR SCHOOL4 = 'M3B' OR SCHOOL4 = 'T7A' OR
SCHOOL4 = 'RFE'OR
SCHOOL4 ='RHB' OR SCHOOL5 = 'RHA' OR SCHOOL5 = 'M3B' OR
SCHOOL5 = 'T7A'OR
SCHOOL5 ='RFE' OR SCHOOL5 = 'RHB' OR SCHOOL6 = 'RHA' OR
SCHOOL6 = 'M3B'OR
SCHOOL5 ='T7A' OR SCHOOL5 = 'RFE' OR SCHOOL6 = 'RHB'
  THEN PROSCOOL = 'YES';
  ELSE IF PRESRANK = '03' AND
SCHOOL3 ='RGA' OR SCHOOL3 = 'RGC' OR SCHOOL3 = '08U' OR
SCHOOL3 = 'RGF'OR
SCHOOL4 ='RGA' OR SCHOOL4 = 'RGC' OR SCHOOL4 = '08U' OR
SCHOOL4 = 'RGF'OR
SCHOOL5 ='RGA' OR SCHOOL5 = 'RGC' OR SCHOOL5 = '08U' OR
SCHOOL5 = 'RGF'
  THEN PROSCOOL = 'YES';
  ELSE IF PRESRANK = '05' AND
SCHOOL4 = 'RRA' OR SCHOOL4 = 'RRB' OR SCHOOL4 = 'RRC' OR
SCHOOL4 = 'RRD'
OR SCHOOL4 = 'RRF' OR SCHOOL4 = 'RRG' OR SCHOOL4 = 'RFB' OR
SCHOOL4 = 'RFC'
OR SCHOOL4 = 'RFX' OR
SCHOOL5 = 'RRA' OR SCHOOL5 = 'RRB' OR SCHOOL5 = 'RRC' OR
SCHOOL5 = 'RRD'
OR SCHOOL5 = 'RRF' OR SCHOOL5 = 'RRG' OR SCHOOL5 = 'RFB' OR
SCHOOL5 = 'RFC'
OR SCHOOL5 = 'RFX'OR
SCHOOL6 = 'RRA' OR SCHOOL6 = 'RRB' OR SCHOOL6 = 'RRC' OR
SCHOOL6 = 'RRD'
OR SCHOOL6 = 'RRF' OR SCHOOL6 = 'RRG' OR SCHOOL6 = 'RFB' OR
SCHOOL6 = 'RFC'
OR SCHOOL6 = 'RFX' OR
SCHOOL7 = 'RRA' OR SCHOOL7 = 'RRB' OR SCHOOL7 = 'RRC' OR
SCHOOL7 = 'RRD'
OR SCHOOL7 = 'RRF' OR SCHOOL7 = 'RRG' OR SCHOOL7 = 'RFB' OR
SCHOOL7 = 'RFC'
```

```
OR SCHOOL7 = 'RFX' OR
SCHOOL8 = 'RRA' OR SCHOOL8 = 'RRB' OR SCHOOL8 = 'RRC' OR
SCHOOL8 = 'RRD'
OR SCHOOL8 = 'RRF' OR SCHOOL8 = 'RRG' OR SCHOOL8 = 'RFB' OR
SCHOOL8 = 'RFC'
OR SCHOOL8 = 'RFX' THEN PROSCOOL = 'YES';
ELSE PROSCOOL = 'NO';

IF SRCENTRY = '21' THEN SOURCE = 'USNA';
   ELSE IF SRCENTRY = '26' OR SRCENTRY = '24' THEN SOURCE =
'ROTC';
    ELSE SOURCE = 'OCS';


IF MARSTAT =:'M' THEN STATUS = 'M';
   ELSE STATUS = 'S';

IF GCT >= 125 THEN GCTSCORE = 'HIGH';
   ELSE GCTSCORE = 'LOW ';

IF PRESRANK = '05';
DATA _NULL ;
    SET ONE;
       FILE  'TOCOLS DATA T' LRECL = 76;
       SELECTOR = RANUNI(999);
       IF SELECTOR LE .021;
         PUT @1 SSN
              @11 FY
              @14 PRESRANK
              @17 SELECTED
              @19 STATUS
              @21 RACE
              @27 SEX
              @29 OCCFIELD
              @38 DUTYSTA
              @42 DEGREE
              @51 SOURCE
              @56 MEDALS
              @65 PROSCOOL
              @69 GCTSCORE
              @74 COMBAT ;
```

APPENDIX I

SAMPLE OF TRANSFORMED DATA

```
067326294 86 O5 Y M WHITE M FXWING   FMF UNDRGRAD OCS  LESSTH2
YES HIGH NO
120329830 86 O5 Y M WHITE M SUPPORT  NON UNDRGRAD ROTC LESSTH2
NO  LOW  NO
018322523 87 O5 N M WHITE M GIB      NON ADVANCED OCS  LESSTH2
YES HIGH NO
464627270 87 O5 Y M WHITE M COMBTRMS NON UNDRGRAD OCS  LESSTH2
NO  LOW  NO
316422692 88 O5 N M WHITE M SUPPORT  FMF ADVANCED ROTC LESSTH2
NO  HIGH NO
448342729 88 O5 N M WHITE M SUPPORT  FMF ADVANCED OCS  LESSTH2
NO  HIGH NO
255705783 88 O5 Y M WHITE M COMBTRMS NON ADVANCED USNA LESSTH2
YES HIGH NO
132369966 89 O5 N M WHITE M SUPPORT  NON UNDRGRAD OCS MORETHN2
YES HIGH NO
438602310 89 O5 N M WHITE M COMBTRMS NON UNDRGRAD OCS MORETHN2
NO  LOW  NO
235704011 89 O5 Y M WHITE M COMBTRMS HQM ADVANCED USNA
MORETHN2 YES HIGH NO
008325320 90 O5 N M WHITE M FXWING   NON ADVANCED OCS MORETHN2
NO  HIGH YE
128341485 90 O5 N M WHITE M SUPPORT  NON ADVANCED OCS MORETHN2
NO  LOW  YE
160360207 90 O5 N M WHITE M SUPPORT  NON UNDRGRAD OCS  LESSTH2
YES HIGH YE
225645914 90 O5 N M WHITE M RTRYWING NON UNDRGRAD OCS MORETHN2
YES HIGH YE
239624393 90 O5 N M WHITE M COMBTRMS NON ADVANCED OCS MORETHN2
NO  HIGH YE
287400114 90 O5 N M WHITE M SUPPORT  NON UNDRGRAD OCS MORETHN2
NO  HIGH YE
381421331 90 O5 N M WHITE M SUPPORT  NON ADVANCED ROTC LESSTH2
NO  HIGH YE
413724381 90 O5 N M WHITE M COMBTRMS FMF UNDRGRAD OCS MORETHN2
NO  HIGH YE
546603498 90 O5 N M WHITE M RTRYWING NON UNDRGRAD OCS MORETHN2
NO  HIGH YE
249689771 90 O5 Y M WHITE M COMBTRMS NON UNDRGRAD OCS MORETHN2
YES LOW  YE
497486009 90 O5 Y M WHITE M COMBTRMS FMF ADVANCED OCS MORETHN2
NO  HIGH YE
```

```
140386141 91 O5 N S WHITE M SUPPORT  FMF UNDRGRAD OCS MORETHN2
NO  LOW  NO
411780113 91 O5 N M WHITE M GIB      NON UNDRGRAD OCS  LESSTH2
NO  HIGH YE
216385585 91 O5 Y M WHITE M COMBTRMS NON ADVANCED OCS MORETHN2
NO  HIGH YE
248841064 91 O5 Y M WHITE M COMBTRMS NON UNDRGRAD OCS MORETHN2
YES HIGH YE
253723832 91 O5 Y M WHITE M COMBTRMS NON UNDRGRAD OCS MORETHN2
YES LOW  YE
228628286 92 O5 N S WHITE M COMBTRMS NON ADVANCED OCS MORETHN2
YES HIGH YE
359383001 92 O5 N M WHITE M SUPPORT  FMF UNDRGRAD OCS LESSTH2
NO  LOW  NO
503607737 92 O5 N M WHITE M RTRYWING NON ADVANCED OCS LESSTH2
NO  HIGH YE
012382801 92 O5 Y M WHITE M GIB      HQM ADVANCED OCS LESSTH2
YES HIGH NO
231705075 92 O5 Y M WHITE M SUPPORT   NON UNDRGRAD USNA
MORETHN2 NO  HIGH YE
245846783 92 O5 Y M WHITE M COMBTRMS NON UNDRGRAD OCS MORETHN2
YES LOW  NO
```

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9. Professor Paul R. Milch, OR/Mh 1
Department of Operations Research
Naval Postgraduate School
Monterey, CA 93943-5000